Timing and Geochemical Evolution of Triassic and Jurassic Magmatism during the Break-up of Pangea along the Eastern North American Margin

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While our understanding of continental break-up has seen dramatic advances over the past decades, the impact of syn-rift melt generation on the transition from mechanical stretching to seafloor spreading remains enigmatic. Early Mesozoic continental break-up along the U.S. Eastern North American Margin (ENAM) is characterized by protracted Triassic lithospheric stretching and syn-rift deposition interrupted by voluminous Central Atlantic Magmatic Province (CAMP) magmatism. This magmatic phase is followed by ~50 Myr of protracted rifting prior to steady-state seafloor spreading. Mesozoic magmatism recognized in outcrop and aeromagnetic datasets along the ENAM has been summarily attributed to CAMP, although extensive regional dikes preserved in the ENAM proximal rift domain remain largely undated. This study provides new constraints on the timing, duration, and geochemical evolution of syn-rift ENAM magmatism using *in-situ* apatite U-Pb geochronology and whole-rock geochemistry and integrates these data into a tectonic model.

We present *in-situ* apatite U-Pb ages and whole-rock geochemical data for 16 diabase dikes and sills from NJ, PA, VA, NC, and SC. A Palisades Sill sample yielded an age of 201 ± 8 Ma and agrees with previous $^{40}Ar/^{39}Ar$ and U-Pb ages. Our new *in-situ* apatite U-Pb ages fall into three clusters and suggest three main pulses of magmatism along the ENAM, with an initial pulse of magmatism at ~205-195 Ma attributed to CAMP. Whole-rock geochemistry of this pulse shows silica (46-53 wt.%), total alkalis (2-4 wt.%), and enrichment of LREEs relative to HREEs, comparable to previously reported geochemical data for CAMP-related rocks along the ENAM. A second magmatic pulse occurred between ~181-175 Ma and shows slightly higher silica and total alkalis, compared to the older CAMP-age phase. The third pulse between ~166-145 Ma generally shows slightly higher silica and total alkalis. LOI and Sr/Yb values of the two younger pulses are similar to CAMP-age samples suggesting no post-crystallization alteration. These new data demonstrate long-lived syn-rift off-axis magmatism persisted ~50 Myr after the onset of CAMP. This post-CAMP off-axis magmatism is likely related to slow magma-limited spreading during the protracted transition to symmetric seafloor spreading along the ENAM.